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(54) Method for the production and application of annular suspension edges of loud speaker diaphragms

(57) This invention concerns a method for the production and application of annular suspension edges of loud speaker diaphragms according to which said annular edge is moulded directly on the edge of the diaphragm, which is pre-loaded in the edge mould.

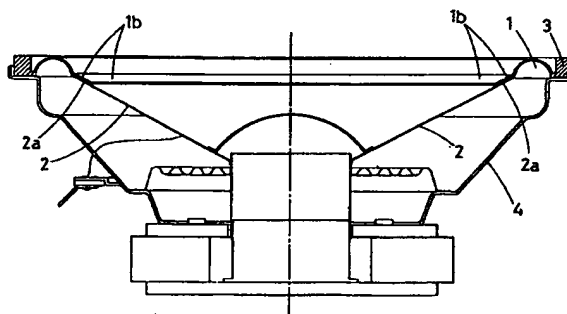


FIG. 1

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## Description

This design patent application concerns a method for the production and application of annular suspension edges of loud speaker diaphragms.

The patent protection is also extended to the item obtained with the method according to the invention. In order to explain the originality and advantages of the method in question, reference is made to the current state of the art for the production and application of annular suspension edges that support loud speaker diaphragms.

The shape of loud speaker diaphragms is that of a truncated cone with circular or elliptical cross-section: at the centre, the diaphragm is joined to the mobile coil, which is in turn supported, by means of an elastic disk, known as a centring element, to the sheet plate basket also having a truncated cone shape, which houses the diaphragm and to which the magnetic circuit is fixed externally.

Said diaphragm is provided on its larger surface with an elastic annular edge by means of which the same is suspended on the mouthpiece flange of the above basket, on which the external lip of said annular edge is glued.

Currently said annular suspension edges are obtained by cutting away the centre of a soft thin disk (or ellipse in the case of an elliptic loud speaker), moulded in plastic, generally polyurethane resin, and characterised by an annular groove having a semi-circular cross-section on its external circumference.

It is evident that the purpose of said annular groove is to make the suspension edge elastically deformable; said suspension edge shall support the diaphragm without however preventing it from following the oscillations of the mobile coil to which the diaphragm is attached, as mentioned above.

Said annular suspension edge is in fact provided with an external lip which is glued on the mouthpiece flange of the basket, and an internal lip which is glued on the edge of the diaphragm.

According to the current state of the art, said suspension edges are first glued on the edge of the diaphragm which therefore is fitted with its annular suspension edge when it reaches the loud speaker assembly station.

There are a number of problems which affect the current state of the art used for the production of said annular suspension edges and their subsequent application to the loud speaker diaphragm.

The first problem is that during production, a quantity of off-cuts is produced whose mass is even greater than the product itself; as mentioned above, the annular suspension edge is obtained by cutting away the centre of a soft thin plastic disk, representing a scrap which is not only a waste of material but also a by no means negligible cost in terms of its disposal.

Secondly, the current state of the art involves high labour costs for the workers who glue the annular sus-

pension edge to the edge of the diaphragm since the gluing operation is not an easy one to automatise due to the difficulty in handling the two elements in question, especially the soft thin annular suspension edge.

The method according to the invention is designed to solve these two major problems of the current state of the art; according to said method the annular suspension edge is moulded directly on the edge of the diaphragm, which is preloaded into the edge mould. It is evident that this method on one hand eliminates the production of scraps and on the other eliminates the need for man power for the application of the annular suspension edge to the diaphragm in that during moulding of said edge the same is also automatically and simultaneously glued to the diaphragm.

These and other advantages of the method according to the invention will be explained more clearly in the description which refers to the enclosed drawings intended for purposes of illustration and not in a limiting sense, where:

- fig. 1 is the cross-section of a standard loud speaker whose diaphragm is fitted with an annular suspension edge obtained by moulding according to the new method in question;
- fig. 2 is similar to fig. 1 with the difference that it illustrates a diaphragm coated with an impermeable plastic layer moulded together with the annular suspension edge.

With reference to fig. 1, the method according to the invention provides that the annular suspension edge (1) is moulded directly on the edge of the diaphragm (2) which is pre-loaded in the edge (1) mould.

This means that during moulding of said edge (1) it is also automatically and simultaneously glued to the edge of the diaphragm (2).

The process according to the invention provides the additional advantage of eliminating the costs for the production and assembly of the gasket that is generally applied to the basket flange.

As shown in fig. 1, if necessary, gasket (3) may also be moulded during moulding of the annular suspension edge (1); after the diaphragm (2) is mounted on the basket (4), the gasket (3) will be positioned exactly on the flange (4a) of the basket (4). The process according to the invention therefore permits making the gasket (3) of the loud speaker basket (4) during the same moulding phase and in the same material as the suspension edge (1), said gasket consisting of suitably shaped annular ribbing on the external lip (1a) of the edge (1).

As mentioned above, the diaphragm (2) is pre-loaded into the edge (1) mould so that edge (2a) of diaphragm (2) touches against and is automatically joined to the internal lip (1b) of edge (1).

Thanks to the method according to the invention, it is also possible to obtain, during moulding of the suspension edge (1), a layer of plastic material (5) which extends from the edge (1) towards the centre of the dia-

phragm (2), covering its entire surface on only one side or both sides, as required.

This layer of plastic material (5) - obtained during the same moulding phase and in the same material as edge (1) - has two functions: the first is to make the diaphragm (2) impermeable, the second is to dampen the vibrations so as to act as a regulation element by means of which it is possible to modulate the tone of the diaphragm.

rates a layer of plastic material (5) extending from edge (1) towards the centre of diaphragm (2) and covering its entire surface only on one side or on both sides.

#### Claims

1. A method for the production and application of the annular suspension edges of loud speaker elements, characterised in that the annular suspension edge (1) is moulded directly on the edge of the diaphragm (2) which is pre-loaded in the edge (1) mould so that the edge (2a) of the diaphragm (2) touches against and is automatically joined to the internal lip (1b) of the edge (1).
2. A method for the production and application of the annular suspension edge of loud speaker diaphragms, according to the previous claim, characterised in that during the same moulding phase and in the same material as the suspension edge (1), the gasket (3) of the basket (4) of the loud speaker is also formed, which consists of suitably shaped annular ribbing on the external lip (1a) of the edge (1).
3. A method for the production and application of the annular suspension edge of loud speaker diaphragms, according to the previous claims, characterised in that during the same moulding phase and in the same material as the suspension edge (1) a layer of plastic material (5) is formed that extends from the edge (1) towards the centre of the diaphragm (2), covering its entire surface on only one side or on both sides.
4. A diaphragm (2) for loud speakers fitted with an annular suspension edge (1) characterised in that said edge (1) is moulded directly on the edge of the diaphragm (2), which is pre-loaded in the edge (1) mould so that the edge (2a) of the diaphragm (2) touches against and is automatically joined to the internal lip (1b) of the edge (1).
5. A diaphragm (2) for loud speakers provided with an annular suspension edge (1) according to claim 4), characterised in that said edge (1) includes the gasket (3) of the loud speaker basket (4), said gasket consisting of suitably shaped annular ribbing on the external lip (1a) of edge (1).
6. A diaphragm (2) for loud speakers provided with an annular suspension edge (1) according to claim 4) characterised in that said edge (1) also incorpo-

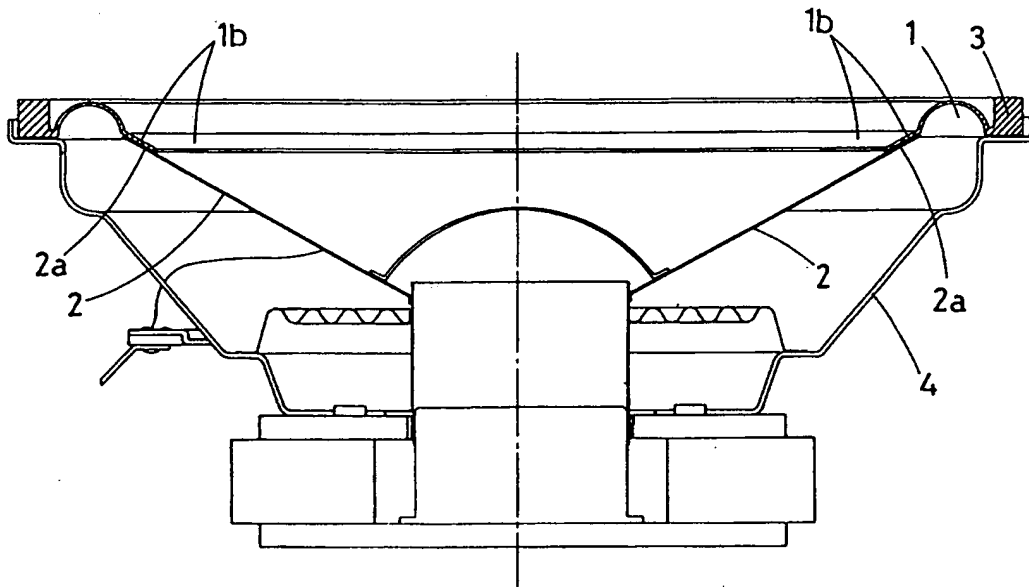


FIG. 1

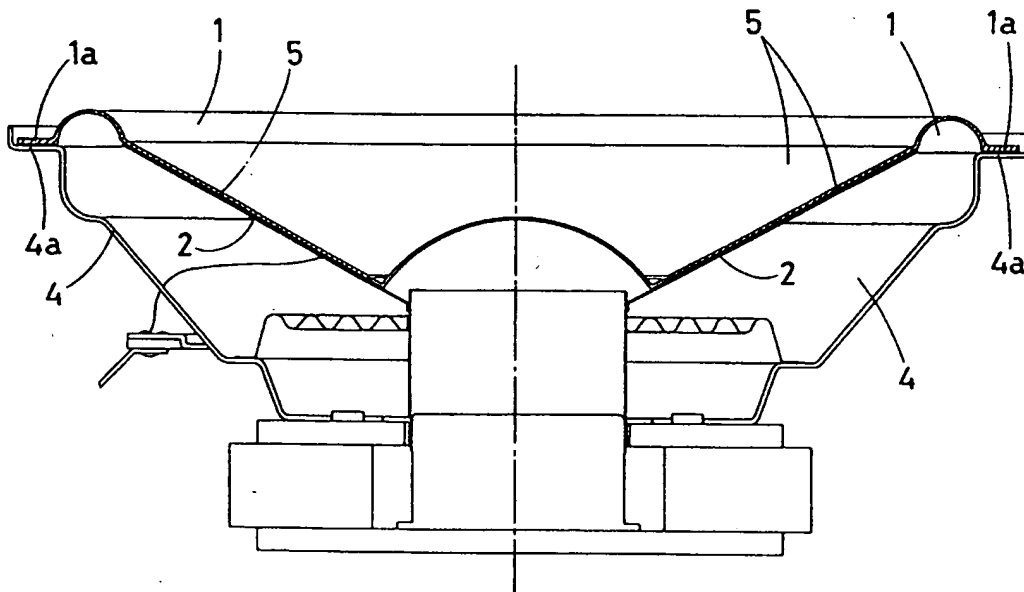


FIG. 2



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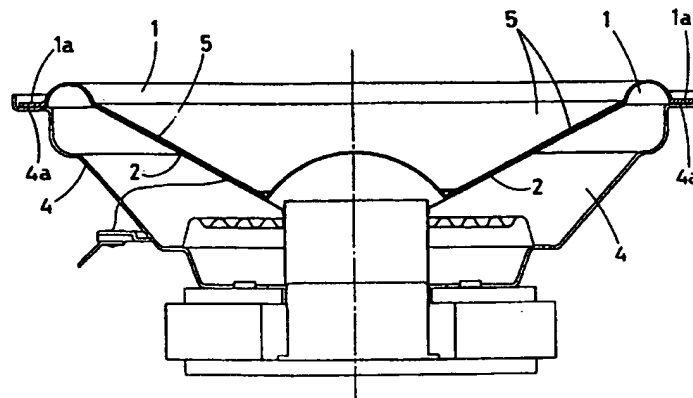


FIG. 2

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# EUROPEAN SEARCH REPORT

Application Number  
EP 96 83 0629

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
X	EP 0 552 040 A (LEACH PATRICK ARTHUR ;LEACH DAVID IAN (GB)) * column 5, line 17 - column 8, line 7; figures 1-3,5,7 *	1,2,4,5	H04R7/18 H04R31/00
Y	---	3	
X	US 5 319 718 A (YOCUM FRED D) * column 5, line 12 - column 8, line 6 * * column 8, line 63 - column 9, line 30; figures 3-6 *	1,4	
Y	---	3	
X	GB 2 094 701 A (MATSUSHITA ELECTRIC IND CO LTD) * page 1, line 6 - line 50 * * page 2, line 58 - line 129; figures 3C,3D,3E,4 *	4,6	
Y	---	3	
A	EP 0 632 674 A (SONY CORP ;TANAKA KOGYO CORP LIMITED (JP)) * column 5, line 10 - column 7, line 18; figures 3A,4A,4B,4C *	1-6	TECHNICAL FIELDS SEARCHED (Int.Cl.6) H04R
A	PATENT ABSTRACTS OF JAPAN vol. 095, no. 009, 31 October 1995 & JP 07 162991 A (SONY CORP), 23 June 1995, * abstract *	1-6	
The present search report has been drawn up for all claims			
Place of search MUNICH		Date of completion of the search 7 May 1998	Examiner Nieuwenhuis, P
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

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